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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/616,097	07/08/2003	Zhi-Wen Sun	AMAT/8241/CMP/ECP/RKK	1645
44257 7590 11/21/2007 PATTERSON & SHERIDAN, LLP 3040 POST OAK BOULEVARD, SUITE 1500 HOUSTON, TX 77056			EXAMINER WONG, EDNA	
			ART UNIT 1795	PAPER NUMBER
			MAIL DATE 11/21/2007	DELIVERY MODE PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/616,097	Applicant(s) SUN ET AL.	
	Examiner Edna Wong	Art Unit 1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 29 October 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 8-10, 20-22, 31-33 and 37-59 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 8-10, 20-22, 31-33 and 37-59 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

This is in response to the Amendment dated October 29, 2007. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Response to Arguments

Claim Rejections - 35 USC § 103

I. Claims **8-9 and 37-44** have been rejected under 35 U.S.C. 103(a) as being unpatentable over **Miura et al.** (US Patent Application publication No. 2003/0155247 A1) in combination with **Dubin et al.** (US Patent No. 6,432,821 B1) and **Wang et al.** (US Patent No. 6,528,412 B1).

The rejection of claims 8-9 and 37-44 under 35 U.S.C. 103(a) as being unpatentable over Miura et al. in combination with Dubin et al. and Wang et al. is as applied in the Office Actions dated May 15, 2006, October 17, 2006, February 28, 2007 and July 13, 2007 and incorporated herein. The rejection has been maintained for the following reasons:

Applicants state that the electrochemically deposited seed enhancement layer **130** is reinforcing and adding thickness to an existing copper seed layer disposed on the substrate, not directly depositing a seed layer on a barrier layer.

In response, Wang teaches that the seed layer **122** may be discontinuous and may not form at the sidewalls and the bottom corners of the interconnect opening **104** (col. 2, lines 56-58). This is what is shown in Fig. 4:

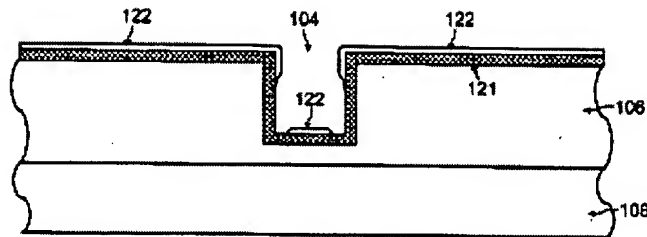


FIG. 4 (Prior Art)

The seed enhancement layer 130 is formed by an ECD (electrochemical deposition) instead of the conventional PVD process such that the seed layer enhancement layer 130 is conformal to continuously cover substantially all exposed surfaces within the interconnect opening 104 (col. 3, lines 4-10).

If the seed layer 122 is not formed at the sidewalls and the bottom corners of the interconnect opening 104, then the barrier material 121 would have been exposed, and the seed enhancement layer 130, formed by an ECD (electrochemical deposition) instead of the conventional PVD process, would continuously covers substantially all of the exposed surfaces.

Applicants state that Miura teaches that a prior deposited copper seed (deposited by CVD or PVD process) must be present to enable the subsequent electrolytic copper plating process.

In response, claim 8, line 3, recites "a substrate comprising". The transitional term "comprising", which is synonymous with "including", "containing", or "characterized by", is inclusive or open-ended and does not excludes additional, unrecited elements or methods steps (MPEP § 2111.03). The substrate as presently claimed is open to having

a prior deposited copper seed (deposited by CVD or PVD process).

Applicants state that that the present application is not open to deposit a copper seed layer by CVD or PVD prior to exposing the substrate to a first copper solution, as asserted by the Examiner, because the first copper solution is arranged to electroplating a seed layer directly onto a barrier layer.

In response, claim 8, lines 1-2, recite "A method, comprising". The transitional term "comprising", which is synonymous with "including", "containing", or "characterized by", is inclusive or open-ended and does not excludes additional, unrecited elements or methods steps (MPEP § 2111.03). The first copper solution reads on electroplating a seed enhancement layer.

The Applicant has a different reason for, or advantage resulting from doing what the prior art relied upon has suggested, it is noted that it is well settled that this is not demonstrative of nonobviousness. *In re Kronig* 190 USPQ 425, 428 (CCPA 1976); *In re Linter* 173 USPQ 560 (CCPA 1972); the prior art motivation or advantage may be different than that of Applicants while still supporting a conclusion of obviousness. *In re Wiseman* 201 USPQ 658 (CCPA 1979); *Ex parte Obiaya* 227 USPQ 58 (Bd. of App. 1985) and MPEP § 2144.

Applicants state that the seed layer preservation process as taught by Miura requires an existing copper seed layer deposited on a barrier layer to enable the

subsequent bulk copper plating process, not as a process for direct depositing a seed layer on a barrier layer as claimed in the present application.

In response, claim 8, lines 1-2, recite "A method, comprising". The transitional term "comprising", which is synonymous with "including", "containing", or "characterized by", is inclusive or open-ended and does not exclude additional, unrecited elements or methods steps (MPEP § 2111.03). The first copper solution reads on electroplating a seed enhancement layer.

The Applicant has a different reason for, or advantage resulting from doing what the prior art relied upon has suggested, it is noted that it is well settled that this is not demonstrative of nonobviousness. *In re Kronig* 190 USPQ 425, 428 (CCPA 1976); *In re Linter* 173 USPQ 560 (CCPA 1972); the prior art motivation or advantage may be different than that of Applicants while still supporting a conclusion of obviousness. *In re Wiseman* 201 USPQ 658 (CCPA 1979); *Ex parte Obiaya* 227 USPQ 58 (Bd. of App. 1985) and MPEP § 2144.

The claims must be given their broadest reasonable interpretation (MPEP § 2111). The method as presently claimed is not just a method for depositing seed layer onto a barrier layer, but also depositing a gap-fill layer.

Applicants state that since Miura specifically teaches the subsequent electrolytic copper plating process cannot be performed without the electric current provided through the seed layer, Miura can not teach or suggest electrolytic copper plating of

seed layer, as asserted by the Examiner.

In response, the rejection is not overcome by pointing out that one reference does not contain a particular limitation when reliance for that teaching is on another reference. *In re Lyons* 150 USPQ 741 (CCPA 1966). Moreover, it is well settled that one cannot show nonobviousness by attacking the references individually where, as here, the rejection is based on a combination of references. *In re Keller* 208 USPQ 871 (CCPA 1981); *In re Young* 159 USPQ 725 (CCPA 1968).

Wang teaches the electrolytic copper plating of a seed (enhancement) layer.

Applicants state that as noted by Mr. Rosenfeld in item 6 of the declaration, Wang's teachings cannot be interpreted as a process for direct depositing a seed layer on a barrier layer. As well known in the art, the seed layer repair process (of Figures 4-5 as indicated by the Examiner) will provide copper ions to bridge over holes or discontinuity in the existing copper seed layer rather than directly depositing a copper seed layer on a barrier layer.

In response, Wang teaches that the seed layer **122** may be discontinuous and may not form at the sidewalls and the bottom corners of the interconnect opening **104** (col. 2, lines 56-58). If the seed layer **122** is not formed at the sidewalls and the bottom corners of the interconnect opening **104**, then the barrier material **121** would have been exposed, and the seed enhancement layer **130**, formed by an ECD (electrochemical deposition) instead of the conventional PVD process, would continuously covers

substantially all of the exposed surfaces.

II. Claim 10 has been rejected under 35 U.S.C. 103(a) as being unpatentable over **Miura et al.** (US Patent Application publication No. 2003/0155247 A1) in combination with **Dubin et al.** (US Patent No. 6,432,821 B1) and **Wang et al.** (US Patent No. 6,528,412 B1) as applied to claims 8-9 and 37-44 above, and further in view of **Nagai et al.** (US Patent No. 6,709,563 B2).

The rejection of claim 10 under 35 U.S.C. 103(a) as being unpatentable over **Miura et al.** in combination with **Dubin et al.** and **Wang et al.** as applied to claims 8-9 and 37-44 above, and further in view of **Nagai et al.** is as applied in the Office Actions dated May 15, 2006, October 17, 2006, February 28, 2007 and July 13, 2007 and incorporated herein. The rejection has been maintained for the reasons as discussed above.

Applicants' remarks have been fully considered but they are not deemed to be persuasive.

III. Claims 20-21 and 45-52 have been rejected under 35 U.S.C. 103(a) as being unpatentable over **Miura et al.** (US Patent Application publication No. 2003/0155247 A1) in combination with **Dubin et al.** (US Patent No. 6,432,821 B1) and **Wang et al.** (US Patent No. 6,528,412 B1).

The rejection of claims 20-21 and 45-52 under 35 U.S.C. 103(a) as being

unpatentable over Miura et al. in combination with Dubin et al. and Wang et al. is as applied in the Office Actions dated May 15, 2006, October 17, 2006, February 28, 2007 and July 13, 2007 and incorporated herein. The rejection has been maintained the reasons as discussed above.

Applicants' remarks have been fully considered but they are not deemed to be persuasive.

IV. Claim 22 has been rejected under 35 U.S.C. 103(a) as being unpatentable over **Miura et al.** (US Patent Application publication No. 2003/0155247 A1) in combination with **Dubin et al.** (US Patent No. 6,432,821 B1) and **Wang et al.** (US Patent No. 6,528,412 B1) as applied to claims 20-21 and 45-52 above, and further in view of **Nagai et al.** (US Patent No. 6,709,563 B2).

The rejection of claim 22 under 35 U.S.C. 103(a) as being unpatentable over Miura et al. in combination with Dubin et al. (US Patent No. 6,432,821 B1) and Wang et al. as applied to claims 20-21 and 45-52 above, and further in view of Nagai et al. is as applied in the Office Actions dated May 15, 2006, October 17, 2006, February 28, 2007 and July 13, 2007 and incorporated herein. The rejection has been maintained for the reasons as discussed above.

Applicants' remarks have been fully considered but they are not deemed to be persuasive.

V. Claims **31-32 and 53-58** have been rejected under 35 U.S.C. 103(a) as being unpatentable over **Miura et al.** (US Patent Application publication No. 2003/0155247 A1) in combination with **Dubin et al.** (US Patent No. 6,432,821 B1) and **Wang et al.** (US Patent No. 6,528,412 B1).

The rejection of claims 31-32 and 53-58 under 35 U.S.C. 103(a) as being unpatentable over Miura et al. in combination with Dubin et al. and Wang et al. is as applied in the Office Actions dated May 15, 2006, October 17, 2006, February 28, 2007 and July 13, 2007 and incorporated herein. The rejection has been maintained for the reasons as discussed above.

Applicants' remarks have been fully considered but they are not deemed to be persuasive.

VI. Claim **33** has been rejected under 35 U.S.C. 103(a) as being unpatentable over **Miura et al.** (US Patent Application publication No. 2003/0155247 A1) in combination with **Dubin et al.** (US Patent No. 6,432,821 B1) and **Wang et al.** (US Patent No. 6,528,412 B1) as applied to claims 31-32 and 53-58 above, and further in view of **Nagai et al.** (US Patent No. 6,709,563 B2).

The rejection of claim 33 under 35 U.S.C. 103(a) as being unpatentable over Miura et al. in combination with Dubin et al. and Wang et al. as applied to claims 31-32 and 53-58 above, and further in view of Nagai et al. is as applied in the Office Actions dated May 15, 2006, October 17, 2006, February 28, 2007 and July 13, 2007 and

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incorporated herein. The rejection has been maintained for the reasons as discussed above.

Applicants' remarks have been fully considered but they are not deemed to be persuasive.

VII. Claim **59** has been rejected under 35 U.S.C. 103(a) as being unpatentable over **Miura et al.** (US Patent Application publication No. 2003/0155247 A1) in combination with **Dubin et al.** (US Patent No. 6,432,821 B1), **Wang et al.** (US Patent No. 6,528,412 B1) and **Dubin** (US Patent Application Publication No. 2004/0108217 A1).

The rejection of claim 59 under 35 U.S.C. 103(a) as being unpatentable over Miura et al. in combination with Dubin et al., Wang et al. and Dubin is as applied in the Office Actions dated May 15, 2006, October 17, 2006, February 28, 2007 and July 13, 2007 and incorporated herein. The rejection has been maintained for the reasons following reasons:

Response to Amendment

Declaration

The declaration under 37 CFR 1.132 filed October 29, 2007 is insufficient to overcome the rejection of claims 8-10, 20-22, 31-59 based upon specific references applied under 35 USC § 103 as set forth in the last Office action because although Applicants state that the copper ions will bridge over holes or discontinuity in the

existing copper seed layer rather than directly depositing a copper seed layer on a barrier layer, as asserted by the Examiner, the teachings of Wang would have suggested that the seed layer **122** may be discontinuous and may not form at the sidewalls and the bottom corners of the interconnect opening **104** (col. 2, lines 56-58).

Thus, there is a question of whether or not there is no seed layer on any part of the surface of the barrier layer.

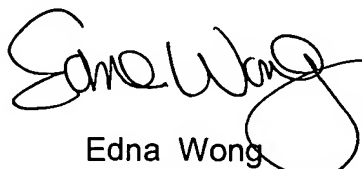
THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Edna Wong whose telephone number is (571) 272-1349. The examiner can normally be reached on Mon-Fri 7:30 am to 4:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen can be reached on (571) 272-1342. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

A handwritten signature in black ink, appearing to read 'Edna Wong', with a large, stylized loop at the end.

Edna Wong
Primary Examiner
Art Unit 1795

EW
November 19, 2007